

Having thus defined the invention, the following is claimed:

1. An electric arc welder for depositing weld metal along a groove between two edges of a metal workpiece, said welder comprising a first electrode driven by a first wire feeder toward a point in said groove, a second electrode driven by a second wire feeder toward said point and a main power source with a first output terminal connected to said first electrode and a second output terminal connected both to said second electrode and directly or indirectly to said metal workpiece to create a second electrode path and a workpiece path, said power source including a high speed switching output stage for creating current with a selected AC waveform between said first and second output terminals, said waveform of said main power source generated by a waveform generator controlling a pulse width modulator circuit to determine the current operation of said output stage and a device for moving said electrodes in unison along said groove in a given direction.

2. An electric arc welder, as defined in claim 1, including a third electrode behind said first and second electrodes and generally movable with said first and second electrodes, said third electrode powered by an auxiliary power source separate from said main power source with a first output terminal connected to said third electrode and a second output terminal connected to said workpiece.

3. An electric arc welder as defined in claim 2 wherein said auxiliary power source includes a high speed switching output stage for creating a selected trailing waveform between said first and second output terminals of said auxiliary power source, said trailing waveform of said

auxiliary power source generated by a waveform generator controlling a pulse width modulator
5 circuit to determine the current operation of said output stage of said auxiliary power source.

4. An electric arc welder as defined in claim 1 wherein said auxiliary power source
includes a high speed switching output stage for creating a selected trailing waveform between said
first and second output terminals of said auxiliary power source, said trailing waveform of said
auxiliary power source generated by a waveform generator controlling a pulse width modulator
5 circuit to determine the current operation of said output stage of said auxiliary power source.

5. An electric arc welder, as defined in claim 4, wherein trailing waveform is an AC
waveform.

6. An electric arc welder, as defined in claim 3, wherein trailing waveform is an AC
waveform.

7. An electric welder, as defined in claim 4 wherein said trailing waveform is a DC
waveform.

8. An electric welder, as defined in claim 3 wherein said trailing waveform is a DC
waveform.

9. An electric arc welder as defined in claim 8 wherein said main power source includes a first and second module power source connected in parallel with said output terminals of said main power source.

10. An electric arc welder as defined in claim 7 wherein said main power source includes a first and second module power source connected in parallel with said output terminals of said main power source.

11. An electric arc welder as defined in claim 6 wherein said main power source includes a first and second module power source connected in parallel with said output terminals of said main power source.

12. An electric arc welder as defined in claim 5 wherein said main power source includes a first and second module power source connected in parallel with said output terminals of said main power source.

13. An electric arc welder as defined in claim 4 wherein said main power source includes a first and second module power source connected in parallel with said output terminals of said main power source.

14. An electric arc welder as defined in claim 3 wherein said main power source includes a first and second module power source connected in parallel with said output terminals of said main power source.

15. An electric arc welder as defined in claim 2 wherein said main power source includes a first and second module power source connected in parallel with said output terminals of said main power source.

16. An electric arc welder as defined in claim 1 wherein said main power source includes a first and second module power source connected in parallel with said output terminals of said main power source.

17. An electric arc welder as defined in claim 16 wherein said first wire feeder is driven by said first module power source and said second wire feeder is driven by said second module power source.

18. An electric arc welder as defined in claim 15 wherein said first wire feeder is driven by said first module power source and said second wire feeder is driven by said second module power source.

19. An electric arc welder as defined in claim 8 including a second power source in series between said second electrode and said metal workpiece to create said workpiece path for said second output terminal of the main power source.

20. An electric arc welder as defined in claim 7 including a second power source in series between said second electrode and said metal workpiece to create said workpiece path for said second output terminal of the main power source.

21. An electric arc welder as defined in claim 6 including a second power source in series between said second electrode and said metal workpiece to create said workpiece path for said second output terminal of the main power source.

22. An electric arc welder as defined in claim 5 including a second power source in series between said second electrode and said metal workpiece to create said workpiece path for said second output terminal of the main power source.

23. An electric arc welder as defined in claim 4 including a second power source in series between said second electrode and said metal workpiece to create said workpiece path for said second output terminal of the main power source.

24. An electric arc welder as defined in claim 3 including a second power source in series between said second electrode and said metal workpiece to create said workpiece path for said second output terminal of the main power source.

25. An electric arc welder as defined in claim 2 including a second power source in series between said second electrode and said metal workpiece to create said workpiece path for said second output terminal of the main power source.

26. An electric arc welder as defined in claim 1 including a second power source in series between said second electrode and said metal workpiece to create said workpiece path for said second output terminal of the main power source.

27. An electric arc welder as defined in claim 26 wherein said first wire feeder is driven by said main power source and said second wire feeder is driven by said second power source.

28. An electric arc welder as defined in claim 25 wherein said first wire feeder is driven by said main power source and said second wire feeder is driven by said second power source.

29. An electric arc welder as defined in claim 28 wherein said second power source has a current output with said selected AC waveform.

30. An electric arc welder as defined in claim 27 wherein said second power source has a current output with said selected AC waveform.

31. An electric arc welder as defined in claim 26 wherein said second power source has a current output with said selected AC waveform.

32. An electric arc welder as defined in claim 25 wherein said second power source has a current output with said selected AC waveform.

33. An electric arc welder as defined in claim 24 wherein said second power source has a current output with said selected AC waveform.

34. An electric arc welder as defined in claim 23 wherein said second power source has a current output with said selected AC waveform.

35. An electric arc welder as defined in claim 22 wherein said second power source has a current output with said selected AC waveform.

36. An electric arc welder as defined in claim 21 wherein said second power source has a current output with said selected AC waveform.

37. An electric arc welder as defined in claim 20 wherein said second power source has a current output with said selected AC waveform.

38. An electric arc welder as defined in claim 19 wherein said second power source has a current output with said selected AC waveform.

39. An electric arc welder as defined in claim 26 including a back plate below said groove and under said workpiece.

40. An electric arc welder as defined in claim 25 including a back plate below said groove and under said workpiece.

41. An electric arc welder as defined in claim 16 including a back plate below said groove and under said workpiece.

42. An electric arc welder as defined in claim 15 including a back plate below said groove and under said workpiece.

43. An electric arc welder as defined in claim 3 including a back plate below said groove and under said workpiece.

44. An electric arc welder as defined in claim 2 including a back plate below said groove and under said workpiece.

45. An electric arc welder as defined in claim 1 including a back plate below said groove and under said workpiece.

46. An electric arc welder as defined in claim 44 including a flux dispenser in front of said third electrode.

47. An electric arc welder as defined in claim 25 including a flux dispenser in front of said third electrode.

48. An electric arc welder as defined in claim 15 including a flux dispenser in front of said third electrode.

49. An electric arc welder as defined in claim 14 including a flux dispenser in front of said third electrode.

50. An electric arc welder as defined in claim 8 including a flux dispenser in front of said third electrode.

51. An electric arc welder as defined in claim 3 including a flux dispenser in front of said third electrode.

52. An electric arc welder as defined in claim 2 including a flux dispenser in front of said third electrode.

53. An electric arc welder as defined in claim 52 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

54. An electric arc welder as defined in claim 51 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

55. An electric arc welder as defined in claim 45 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

56. An electric arc welder as defined in claim 44 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

57. An electric arc welder as defined in claim 43 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

58. An electric arc welder as defined in claim 26 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

59. An electric arc welder as defined in claim 25 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

60. An electric arc welder as defined in claim 24 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

61. An electric arc welder as defined in claim 16 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

62. An electric arc welder as defined in claim 15 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

63. An electric arc welder as defined in claim 14 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

64. An electric arc welder as defined in claim 5 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

65. An electric arc welder as defined in claim 4 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

66. An electric arc welder as defined in claim 3 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

67. An electric arc welder as defined in claim 2 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

68. An electric arc welder as defined in claim 1 wherein said waveform generator of said main power source includes a circuit to adjust the frequency of said AC waveform.

69. An electric arc welder as defined in claim 52 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

70. An electric arc welder as defined in claim 51 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

71. An electric arc welder as defined in claim 45 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

72. An electric arc welder as defined in claim 44 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

73. An electric arc welder as defined in claim 43 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

74. An electric arc welder as defined in claim 26 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

75. An electric arc welder as defined in claim 25 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

76. An electric arc welder as defined in claim 24 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

77. An electric arc welder as defined in claim 16 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

78. An electric arc welder as defined in claim 15 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

79. An electric arc welder as defined in claim 14 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

80. An electric arc welder as defined in claim 5 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

81. An electric arc welder as defined in claim 4 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

82. An electric arc welder as defined in claim 3 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

83. An electric arc welder as defined in claim 2 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

84. An electric arc welder as defined in claim 1 wherein said waveform generator of said main power source includes a circuit to adjust the duty cycle of said AC waveform.

85. An electric arc welder as defined in claim 52 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

86. An electric arc welder as defined in claim 51 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

87. An electric arc welder as defined in claim 45 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

88. An electric arc welder as defined in claim 44 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

89. An electric arc welder as defined in claim 43 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

90. An electric arc welder as defined in claim 26 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

91. An electric arc welder as defined in claim 25 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

92. An electric arc welder as defined in claim 24 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

93. An electric arc welder as defined in claim 16 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

94. An electric arc welder as defined in claim 15 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

95. An electric arc welder as defined in claim 14 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

96. An electric arc welder as defined in claim 5 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

97. An electric arc welder as defined in claim 4 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

98. An electric arc welder as defined in claim 3 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

99. An electric arc welder as defined in claim 2 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.

100. An electric arc welder as defined in claim 1 wherein said main power source includes a circuit to adjust the percentage of the positive portion of said AC waveform compared to said negative portion of said AC waveform.